Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

ANIMAL INTELLIGENCE.

BY JAS. WEIR, JR., M. D.

"Intelligence is a conservative principle, and will always direct effort and use into lines which will be beneficial to its possessor."[1] This definition of intelligence is peculiarly applicable to the lower animals, inasmuch as it does not convey any idea of a purely intellectual operation of the mind. Every instance of ratiocination in the lower animals, has its origin in the fundamental principle of benefit to the animal evincing this faculty of reason. The words, reason and intelligence, are, in a measure, synonymous, for without intelligence, reason can not exist and *vice versa*—without reason there can be no intelligence. They are both psychic factors, dependent each upon the other. The lower animals do not evince a high degree of intelligence, yet high enough to lift the mental operation above the automatic and spontaneous action generally called —instinct. Instinct itself is, in a certain sense, a process of intelligence, though its immediate operations may not be due to reason. Instinct involves mental operations; if it did not it would simply be reflex action. It is heredity under a special name. The father transmits his mental peculiarities as well as his corporeal individualites to his son. The experiences of thousands of years leave their imprint on the succeeding generations until deductions and conclusions drawn from these experiences become in man, that psychic essence called mind. The lower animals pass through a like experience and arrive, each in his own sphere and degree, at a kindred mental destination.

Reflex action is simply muscular adaptation excited by appropriate stimulation without mental cognizance. Instinct has always a mental element; and the lowest animal that lives is no more governed by reflex action than is man himself. The action of a spider spinning her web, is just as voluntary and is as much under mental direction and control, as the action of a carpenter building a house. That the very lowest forms of animal life give evidences of intelligence can no longer be denied. A very common rotifer whose body is cup-shaped and whose tail is armed with forceps, has been seen to seize a larger specimen with its forceps and thus attach itself to its cup. The larger rotifer immediately swung itself violently about until it met a piece of weed, this it seized with its forceps and began "the most extraordinary movements which were obviously directed toward ridding itself of its encumbrance." This it finally succeeded in doing, and the entire scene was so like intelligent action that the observer concludes "so that if we were to depend upon appearances alone, this one observation would be sufficient to induce me to attribute conscious determination to these microscopical organisms."[2] Conscious determination and ratiocination is found in animals as low down in the scale of animal life as the Rhizopoda. *Aethalia* will confine themselves to the water in a watch-glass in which they are placed, but when the glass is placed on sawdust, they will leave the water and go to the dust—their natural habitat.[3] These rhizopoda are content to remain in the water, as long as there is no sawdust in their vicinity, but as soon as they recognize the sawdust *through the glass*, they crawl over the rim of the latter to get into a more pleasing abode. This is a wonderful example of conscious determination to be found in an organism so low in the scale of life. Once, while examining some fungal cells, Carter saw a still more wonderful instance of intelligence in a rhizopod. He noticed that one of the spore cells had ruptured and that grains of starch were escaping from the crevice. Suddenly an *actinophrys* came into the field of vision and proceeding to the ruptured cell seized a grain of starch and then retired to some distance. Presently it returned to the same cell and extracted another grain through the crevice. "All this was repeated several times showing that the *actinophrys* knew that those were nutritious grains, that they were contained in this cell,

---

[1] Cope: Origin of the Fittest, p. 40.

[2] Romanes: Animal Intelligence, p. 18.

[3] H. J. Carter: Annals of Natural History.

and that, although each time after incepting a grain it went away to some distance, it knew how to find its way back to the cell again which furnished this nutriment."[4] Oysters taken from a bank never uncovered by the sea, open their shells, lose the water within and soon die; but oysters kept in a reservoir and occasionally left uncovered, learn to keep their shells closed and live much longer when taken out of the water.[5] This is an act of intelligence due directly to experience without even the factor of heredity. It is an instance of almost immediate adaptation to surrounding circumstances One would not expect to find examples of animal intelligence in such a low order as the *Helicidæ*, yet several instances can be adduced where snails have not only shown ratiocination, but have also evinced love and affection.

A gentleman fixed a land-snail, with the mouth of the shell upward, in a chink of a rock. The animal protruded its foot to the utmost extent and, attaching it above, tried to pull the shell vertically in a straight line. Then it stretched its body to the right side, pulled, and failed to move the shell. It then stretched its foot to the left side, pulled with all its strength and released the shell. There were intervals of rest between these several attempts, during which, the snail remained quiescent.[6] Thus we see that it exerted force in three directions, never twice in the same direction, which fact proves conscious determination and no slight degree of intelligence. An observer, Mr. Lonsdale, placed two snails in a small and badly kept garden. One of them was weak and poorly nourished, the other strong and well. The strong one disappeared and was traced by its slimy track over a wall into a neighboring garden where there was plenty of food. Mr. Lonsdale thought that it had deserted its mate, but it subsequently appeared and conducted its comrade over the wall into the bountiful food supply of the neighboring garden. It seemed to coax and assist its feeble companion when it lingered on the way.[7] Here we see not only an example of memory and discrimination, but also of affection and solicitude. After the snail had made its voyage of discovery, with rare unselfishness and true affection, it remembered its sick mate and returned for it.

---

[4] Ibid.

[5] Dicquemase: Journal de Physique, Vol. XXVIII, p. 244.

[6] White: A Londoner's walk to Edinburgh, p. 155.

[7] Darwin: Descent of Man, pp. 262–3.

Beneath the pavement in front of my door, a wasp (*Vespa nigra*) has her nest. The entrance to this nest is at the bottom of a *sulcus* formed by two parallel bricks. I rolled a piece of paper into a compact wad and placed it between the bricks and over the entrance during her absence. When she returned she seized the paper with her jaws and forelegs and endeavored to pull it away. This was prevented by the interposition of the brick on which she stood. She then went to the other side and tried again. Here she failed for the same reason. She then descended into the little gully between the bricks and easily removed the wad. When she again left the nest, I replaced the paper, and on her return she went through the same performance as at first. Again I replaced it, but the *third time she went at once into the gully and removed the obstruction.* This she did three times in succession. Comment is hardly necessary. The evidences of memory and ratiocination are too patent to be denied. Some members of another family, distantly related to the *Helicidæ*, the limpets, show evidences of intelligence, inasmuch as they have a very accurate memory of direction. Limpets, when at rest, live at certain fixed domiciles. When hungry, they leave these homes in search of food, but invariably return to them as soon as they have satisfied their hunger. One very pointed instance of this homing sense is given by Hawkshaw, a most careful and exact observer. A limpet had made a clearing on a sea weed covered block of chalk. In the center of this clearing was a pedestal of flint which projected an inch or more. On the top of this flint pedestal the limpet had taken up its abode. The cleared space had several hollows where the animal could have easily sheltered itself, but it preferred to return to its exposed home after each of its excursions.[8]

Not many years ago, a French exhibitor with a trained company of fleas passed through the country. These insects had been taught to march and counter-march, to dance, to feign death, to pull miniature coaches, etc., etc. While this does not evince voluntary ratiocination, it shows that fleas think and are capable of receiving instruction. "When we consider the habits of ants, their social relations, their large communities, and elaborate habitations, their roadways, their possession of domestic animals, and even, in some cases, of slaves, it must be admitted that they have a fair claim to rank next to man in the scale of intelligence."[9]

---

[8] Hawkshaw: Journal Linn. Soc., Vol. XIV, p. 406.

When Lubbock says that the ant ranks next to man in the scale of intelligence he does not err. The superior intelligence of the ant has been recognized and commented on by man since the very inception of history. The wisest man of his day, King Solomon, uses the ant to point a moral. He considers her intelligence and industry worthy of emulation, and says to the sluggard: "Go to the ant, consider her ways and be wise." This one factor, intelligence, and the faculty of intercommunicating intelligently, makes a colony of ants a *perfect* society. Their social relations make it a model republic. Ants are true socialists; communists of an ideal type. Their's is a patriotism sublimely grand in its total self abnegation. The commonwealth is everything—individual weal is not considered. Man is susceptible to individual attachments which form the basis of his happiness. The affection of ants, on the contrary, is a patriotism that is extended to the whole community, "never distinguishing individuals, unless, as in the instance of the communal mother, connected with the furtherance of the common good."[10] Ants can undoubtedly communicate. A short while ago I crushed a pismire in the track usually taken by the members of a colony inhabiting the hollow of a beech tree standing in my yard. A soldier ant came along presently and, smelling the blood of his murdered companion, was seized with a panic terror, and rushed away into the nest. He shortly returned with thirteen companions and made a slow and careful reconnoissance of the dead body and its surroundings. Then all of them examined the corpse, and, having satisfied themselves that their sister was dead, returned to the nest. In a few moments a large worker-ant, accompanied by two soldier ants, came out and proceeding to the body, picked it up and carried it down the tree to the ground. They then went beneath the grass and I lost sight of them. Their every action seemed to me to be governed by an almost human intelligence. The discoverer of the murder hurried into town, gave the alarm, and, quickly gathering some of his companions, went out in search of the murderer. On discovering that their companion was dead and her slayer absent, they came back to town and sent out a burial party.

---

[9] Lubbock: Ants, Bees, and Wasps, p. 1.

[10] Kirby and Spence: Entomology—"Perfect Society."

The ant is the only animal except man, which has slaves and domestic animals. Their intelligence is so highly developed that they make a perfect success in rearing their cattle and in capturing their slaves. The cattle of the ants are of the order *Aphididæ.* The herdsmen of these aphidian cattle can be seen patroling the shrubs on which the aphides are grazing. On them devolves the care of the herds. They bring them out in the morning and carry them back at night. They gather the eggs of the aphides, carry them into a specially built nursery, attend them carefully until the young aphides are hatched out, and then carry them to the shrubs most liked by them for food. Some strange sense enable them to recognize one another—an ant of the same species, but coming from another nest, is immediately recognized as a stranger and at once attacked. If the eggs of one ant colony are hatched out in another of the same species, the young ants are at once known to be strangers and intruders. This far transcends our intelligence. What mother could recognize her infant if it were born in the dark and she had never seen it? Again, if the *larvæ* of ants are removed, hatched outside of the nest, and then returned, the ants at once recognize them as kinsmen and receive them into the nest.[11] That ants and bees do communicate intelligently is no longer denied. Their means of communication is not definitely known, but it is the opinion of most scientists that it is through their antennæ.

---

[11] Lubbock: Ants. Bees, and Wasps, p. 119, et. seq.

I once saw wonderful evidences of this power of intelligent communication while watching a battle between *Lasius niger* and *Lasius flavus*. The black ants were on a foray; the booty in question being a large herd of aphides owned by the yellow ants. The yellow ants had a commissariat department and an ambulance corps. I frequently saw them drop to the rear during the battle and partake of refreshments. Those slightly wounded were also attended to by the ambulance corps. The black ants were in light marching order, and had neither of these conveniences and necessary adjuncts. These ants seemed to be governed by a high order of intelligence in this battle. The yellow ants repeatedly sent back to their village for reinforcements and in this instance were victorious. They were not so fortunate, however, in a second battle I witnessed, a short time afterward. Their antagonists were of the same species as in the first battle, but from a different colony. In this second battle the yellow ants were all slain, and their herds of aphides carried off by their conquerors.

The bee ranks next to the ant in point of intelligence and I have witnessed numerous instances of ratiocination in these interesting little animals. My bee-house is built of brick, without windows and has only one small door. The hives are made of glass and covered with thick curtains of muslin. This renders observation very easy. On one occasion I noticed that from some cause, a comb had become detached and was in danger of falling to the floor. The bees had noticed this before it had become apparent to me, and had begun to provide against disaster. They rapidly built a broad, thick support of wax between the endangered comb and the one next to it, thus securing it firmly. They then reattached the detached comb securely to the roof of the hive. When this had been done, they took away the temporary support and used the wax elsewhere. When men see a wall out of plumb and in danger of falling, they use like methods to prevent disaster. De Fravière says that bees have a number of tones which they emit from the stigmata of thorax and abdomen and by which they communicate information.[12] When a bee arrives with important news she emits several shrill notes and taps a comrade with her antennæ ; this comrade passes the news to another, this to another and so on throughout the hive. If the news is pleasing all remains orderly, but if the news presages danger, great excitement arises. The news of danger is always carried first to the queen as the most important person in the community.[13] I have heard these tones and believe with De Fravière that bees communicate information in this way. The queen emits a tone which is different from those of the workers. When the queen makes a progress through the hive while laying eggs, she frequently emits this cry. As soon as the workers hear it, they bow their heads and remain quiescent for several seconds. Both ants and bees show great affection for their young. They feed and cleanse them and assist them in every way possible. The young ant is shown all of the devious pathways and corridors in the habitation by the older ants, and her first visit into the world is made with several chaperones.

There is a spider peculiar to this locality (Daviess Co., Ky.) which I have never seen elsewhere and which I have not seen described. This spider spins two webs; one is a trap set for the procurement of her food, the other is built for the gratification of an æsthetic feeling hardly to be expected in an animal so low in the scale of animal life. This latter web is generally spun in the angle formed by two walls, and always where the early morning sun can shine on it for several hours. Through the center of the web, reaching from one extremity of its long diameter to the other, the spider spins a ribbon of silk about an inch broad. This ribbon is very beautiful. The mesh is as closely woven as silk itself, and shines in the sunlight like a band of silver. As soon as the sunlight falls upon this web, the spider makes her appearance and walks slowly up and down her glittering roadway. She is not at all timid and I have watched her for hours at her strange performance. She irresistibly reminded me of some well dressed woman who was out for a morning walk. She never left this ribbon to secure food, though I tempted her frequently with insects. After an hour or two of promenading, she would leave this web and go to her trap-web, which is generally situated near her place of amusement. This she kept up day after day until the duties of maternity called her elsewhere. I have never seen the male. There is but one other instance in the animal kingdom where an animal builds a special place of amusement. That animal is the bower bird, of which mention will be made further on.

---

[12] Romanes: Animal Intelligence, p. 158.

[13] Ibid.

Curiosity is largely developed in birds. The blue jay is the most curious as well as the most voluble of all birds. I have been able to differentiate twenty-three distinct utterances in the language, if I may use the word, of the jay. On one occasion, I left a glass jar containing three newts, on a large block of sandstone in my front yard. It had not been there long before a jay flew down to examine it. One of the newts made a quick motion, and uttering a cry of surprise the jay flew to a tree overhead. He remained quiet for an instant, as if in profound thought. He then uttered his assembly call and birds of all kinds came hurriedly flying up in answer to it. In a few moments I noticed in the surroundings trees, jay-birds, wood-peckers, sap-suckers, cat birds, song sparrows, orioles, mocking-birds, blackbirds, pee-wees and flickers. They made a terrible outcry, but suddenly became silent, when the jay, which had called them together, flew down to the rock. Several of his most courageous brethren immediately followed him. He went up to the jar, and made a careful examination of it and its contents, all the while uttering a low querulous monologue. Suddenly he uttered three loud, peculiar cries and flew away. The assembly then dispersed. On another occasion I noticed a jay sitting silent and absorbed on the roof-tree of a grape arbor. He appeared to be watching something beneath him very intently. On focusing him in my glasses, I discovered that he was in a state of great excitement and trembling all over. I noticed the direction of his gaze and soon saw the object of his regard. A large male cat was stalking a hare and was just crouching to make his spring. He sprang at the hare, but his jump fell short, and the hare bounded away in safety. And then the jay-bird seemed to be fairly overcome with delight. He trounced himself up and down, screaming with sarcastic laughter. He seemed to be jeering and ridiculing the cat to his fullest extent, and the cat seemed to understand him. He dropped his tail and disappeared in the bushes. The jay uttered one last note of derision and then flew away.

I once saw a very young cockerel come up behind an elderly hen and suddenly embrace her. When she discovered the youth of her assailant, her surprise, indignation and wrath was perfectly apparent and very laughable. Birds show a distinct individuality in nest building. No two pair of birds, even of the same species, build nests alike. To the casual observer they appear alike, but to the careful and experienced nest hunter, there is a marked originality in each nest. The general forms are the same, but each pair of architects leave the impress of individual genius on their particular nest. Three pairs of cardinals have been nesting in my garden for several years. If shown the nest, I can tell the pair of birds which built it. Wallace gives an instance of original nest building. Several pairs of bullfinches were taken to Australia when quite young. When they came to build their nests, they built them totally unlike those of the English bullfinch. They were long and round, like those of the oriole, only the entrance was at the bottom.[14] Some birds have developed æsthetic feeling and have a well marked love for the beautiful. Certain humming birds decorate their nests with beautiful pieces of lichen which they fasten on the outside. Feathers and various colored mosses are used for the same purpose.[15] Darwin asserts that the curious structures of the bower birds are pleasure houses, built by the birds for their own amusement and sports.[16] These bowers are not nests and are never continuously occupied by the birds. The nests are built in the jungle some distance from the bowers. The birds

[14] A. R. Wallace: Darwinism.

[15] Gould: Birds of Australia, Vol. I, p. 442.

[16] Darwin: Descent of Man, pp. 92, 406.

first build a platform of sticks and twigs, all of the knots and short twigs being turned toward the ground, thus giving a perfectly smooth floor. The bower, an oblong, oval structure, open at both ends, is then erected on this platform. This is also made of twigs, with all projections turned outward. The entrance to this bower is decorated with feathers, bones, shells, mosses and, in fact, any gaily colored article which the bird can procure. Evidences of intelligence in the higher orders of animals are so patent that even the most casual and superficial observer can see them. The cat, the horse, and the dog are nearer to man in his daily life than any other animal, and instances of their intelligence are very numerous.

I present here a letter of Mr. J. Gibson Taylor, Owensboro, Ky., in which he relates a remarkable instance of ratiocination in a dog. "The dog, a water spaniel, had gone after a stick flung upon the ice of a pond about twenty feet distant from shore. The water was about five feet deep. The ice gave way. The dog went under the water several times in swimming about the enlarged space made by attempting to regain the surface of the ice, which gave way under his weight. He became thoroughly chilled by much confused swimming about in a circle, seeking some point at which the ice would bear his weight. I reached a limb to him and calling him by name shortly got his attention. He placed his paws upon the ice and seemed to listen intently as I extended the limb toward him, the ice, meanwhile, sinking under his weight as he looked at me. He caught the limb between his teeth and I assisted him by pulling him toward me upon the thicker ice inshore. Finally the ice became strong enough, about 15 feet from shore to sustain his weight. So, still with his teeth locked on the stick, I pulled him on the thicker ice and across the surface to the shore."

Here the dog, fully seeing his danger, and understanding the purport of the stick thrust out to him by his master, grasped it with his teeth, and held on until he was dragged into safety. Could man do more or reason better?